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ABSTRACT

Research clearly supports the efficacy of self-directed teams in the learning of information systems (IS) skills. This paper proposes that the use of self-directed teams demands a considerable amount of direction on the part of the instructor. Students in two sections of an introductory IS class were surveyed with explicit questions about their experience as part of a team in the class. The discussion of results covers approaches to forming teams, grading, structured tasks, student reaction to teamwork, advantages of teamwork, and projected course changes. Findings indicate that an evolution of approaches in structuring teams is a necessity. Results suggest that a systematic and formal evaluation of collaborative learning experience is desirable. A copy of the student questionnaire is appended. (Author/MES)

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SELF-DIRECTED TEAMS IN THE INTRODUCTORY INFORMATION SYSTEMS COURSE: LESSONS LEARNED

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Research clearly supports the efficacy of self-directed teams. This paper proposes that the use of self-directed teams demands a considerable amount of direction on the part of the instructor. Students in two sections of an introductory information systems class were surveyed with explicit questions about their experience as part of a team in this class. Findings indicate that an evolution of approaches in structuring teams is a necessity. Results suggest that a systematic and formal evaluation of the collaborative learning experience is desirable.

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INTRODUCTION

It is generally accepted that the use of teams promotes the learning of information systems (IS) skills. It is also generally accepted that teamwork is one of several techniques, along with active class discussion, case studies, debates, games, simulations, etc., for facilitating this learning. Principle reasons for teamwork include:

1) active learners are more effective learners (Hassard 1990)
2) not all students learn in the same way—some have verbal orientation, some are "hands-on," along with a plethora of other dimensions
3) teams serve as a vehicle for promoting communication, people, and problem solving skills, valued in both the business and academic worlds (National Institute of Education, 1984)
4) the business world routinely expects professional school graduates to have experience with teamwork
5) collaborative learning fosters more efficient and effective processing and retention of information (Johnson, 1991; Keeler and Anson, 1995).

Although there is widespread agreement on the positive benefits, there is no universal agreement on the techniques which will best deliver these benefits. Should teams be self-selected or should they be formed by the students? Should students be graded individually, as a team, or some mix? Are teams most appropriate for upper level classes, or are they suitable for all levels? The literature has addressed these and many other questions (see, for example, Rau, 1990, and Pollalis, 1995).

It seems reasonable to assert that the success of particular techniques are influenced by a number of factors, including prominent factors such as knowledge and maturity of the students, the teaching style of the instructor, and the content and goals of a particular class, will influence the outcomes of collaborative learning. One common approach to teamwork is "self-directed teams," which puts the team at the center of learning where the instructor becomes more of a guide than the source of all knowledge, circulating among the teams, responding to questions, monitoring the progress of groups (Dutt, 1994). "Self-directed" is somewhat misleading, because it does not mean that the instructor abdicates all responsibility for the team's performance. Rather, the instructor is actively involved in establishing the general objectives, and having the teams responsible for determining many of the rules for accomplishing those objectives.

One of the most challenging courses to exploring student teams is the introductory IS course. A wide range of topics and a wide range of student backgrounds necessitate an approach different from a constant diet of lecture and note taking.

I have taught introductory IS classes to undergraduates for most of the past ten years, and like many instructors, have gravitated away from heavy reliance on lecture to a much

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greater dependence on self-directed teams. I began my evolution toward teamwork both because of the five principles cited above and because of a sense of frustration with the level of learning in class. Many students simply were not understanding the material to my satisfaction. At first, I resisted the idea of teams because of fears that I was not fulfilling my duties when merely circulating among busy students and because I was fearful of not covering all the material dictated by the course outline. Nevertheless, my frustration with the old methods proved sufficient motivation to begin experimenting with self-directed teams.

I choose the term "experiment" deliberately, for I firmly believe there is not one tried and true approach. Over the years, I have continued to modify my approach, relying on intuition, reports from colleagues, suggestions from the literature, and feedback from students--including both standard instructional reports and anecdotal evidence. This past year, I have finally hit upon an approach that leaves me reasonably satisfied with student performance. In addition, I believe I have only crossed the threshold of satisfactory performance, and have become excited about the possibility of a quantum leap in improvement for the coming year. The reason for the excitement is due to a technique already employed by many of my thoughtful colleagues, and a technique I heartily endorse for anyone regularly teaching introductory IS. That technique consists of formulating a questionnaire especially designed to evaluate student thoughts and beliefs about the team approach; furthermore, I ask the students open-ended questions about future improvement. Of course, results must be interpreted sensitively and thoughtfully, for not all responses can be taken at face value.

THE COURSE

All of us who teach introductory IS have environmental factors at our schools which force modifications to our approach to collaborative learning. At my school, the course is a general education course, and must meet University-wide general education requirements: both oral and written presentations are required as part of the course work, for example. As such, we have a few juniors and seniors along with many freshmen and sophomores. The course is a required one for all business majors, but other majors, e.g., nursing and the professional pilot program, require the class of their majors. Like many schools, we have a wide range of competencies represented in each class.

Another factor influencing collaborative learning is poor facilities: although the classes typically enroll 37 students, the business lab has only 24 networked PCs. It was partly because of this imbalance that I moved to a team approach. My solution was to divide the teams into ten teams of three or four students, with a "captain" in each team. The captain is always computer literate and has the job of serving as consultant for teammates who are learning computer literacy. This arrangement creates a job for everyone during lab times. I spend half the term in the labs, and I have found that unless I am there monitoring progress, the majority of students do not learn competency. There are fifteen projects to complete during the course of the semester. Roughly half of these projects stress basic competency, and the other half stress higher order learning. The software for the course includes word processing, spreadsheets, e-mail, Internet, with progressively more multitasking required.

THE QUESTIONNAIRES

I presented students with an explicit questionnaire, designed to test the students perceptions of the collaborative learning in the labs (see Appendix A). Students received a bonus of two percent of the course grade for conscientiously filling out the forms. Students were required to include their names on the questionnaire, so that I could perform more detailed analysis.

I was very impressed with the sincerity of student response. I believe I established a great deal of trust with the students during the term. They were guaranteed that their responses would in no way reflect upon their course grade, other than receiving a two-point bonus. The depth of thought put into the open-ended questions was impressive. Furthermore, there was no missing data for any of the twenty-five objective questions.

I administered the questionnaire to two sections of introductory IS. One class was composed of 36 students, and the other 33. There were no obvious demographic differences between the classes. In the first class, 27 students took the survey; 28 in the second class.

FORMING TEAMS

There are many approaches to forming teams, a number of which have proven successful. Student selected versus instructor selected is the first, and perhaps most important, consideration. While some have reported success with students' self selection, this procedure is not viable at my school. Given the wide variation in skill levels, it seems heartless to leave team formation to the students. This is an instance where I chose to ignore the students responses to the questionnaire: 15 percent of the students indicated

that the most important change to make for next year (open-ended question) would be to let students form their own teams. Of course, those students who found themselves on poorer teams or those students who already knew some of their classmates are inclined toward student-selected teams. However, allowing students to self-select teams would doubtless result in an even greater variation of team ability. My deepest sympathies lie with those shy students with few computer skills--it is my duty to ensure they are placed on a team with some expertise. Dutt (1994) reports that cooperative learning research indicates that teams are more likely to be successful when membership is defined by the instructor.

Like Dutt, I made it my goal to have the teams as heterogeneous as possible. To do so, on the first day of class I had students rate themselves on their degree of expertise in each of five areas: operating systems, word processing, spreadsheets, database, and programming languages. Students ranked themselves on a scale of 0-5, with zero indicating no experience, one indicating a novice, and five indicating expert status. In both sections, there were enough experts to allow the formation of ten teams, composed of three or four students. Each team was guaranteed one expert, with the remainder distributed as heterogeneously as possible.

It must be understood that this procedure has its flaws. Students do not always evaluate their expertise accurately. As it turned out, in each section there were two to three experts, deemed captains, who either did not have the advertised expertise or the sense of responsibility to serve as team leader. This inaccuracy can be corrected by including a few key questions which will allow me to evaluate their expertise. For example, to evaluate students' expertise with spreadsheets, students can be asked to explain the difference between relative and absolute addressing. However, assessing students' depth of responsibility may be more difficult. Our introductory IS classes have a sprinkling of juniors and seniors, and we lso tend to have 25 percent nontraditional students. Because upperclassmen and nontraditional students tend to have more maturity, perhaps responsibility can be distributed heterogeneously as well.

Nevertheless, I am reasonably satisfied with the team captain approach. I am flexible enough to allow captaincy to shift from project to project, as the students see fit. I am encouraged that 18 percent of the students reported that the number one practice which should be unchanged next year (open ended question) is the way teams are formed. Some fine-tuning of the captaincy will occur next year, and I anticipate greater success.

GRADING

According to Dutt (1994), how to evaluate team performance is the major challenge that cooperative learning faces. Whether to grade students individually or to grade them as a team is a question which has not been resolved. At one extreme are instructors who perceive that the most important duty of a professor in the classroom is to discriminate among students; thus elaborate schemes are devised to evaluate individual student performance and to subtract, as much as possible, the effects of total team performance.

On the other extreme is a report from one of the leading employers of our students (USA Group, 1998). The contention from this company was that in the business world, teams are evaluated solely on team effort, with individual contribution irrelevant. The company strongly encourages university teamwork be graded based solely on the merits of the team efforts.

Questionnaire results on this issue were mixed, with about equal numbers of students supporting a heavier emphasis on team output versus individual grading. Perhaps Dutt's (1994) suggestion, that evaluations be a mix of student and team grades, is the best. This is the approach I used--some projects were graded individually and some as a team. There are a number of innovative approaches to fine-tuning this mix problem. One of the more innovative approaches is to have students take exams, first as individuals, and then as a team effort. Eighty percent of the final grade is individual, and twenty percent team (Dutt, 1994). Student response to this approach was neutral, with virtually equal numbers agreeing as disagreeing.

STRUCTURED TASKS

At this point, I feel it is necessary to interject what may be obvious to some. Using self-directed teams does not imply that tasks for these teams are unstructured. It has been my experience that the more clearly requirements are specified, the more closely student performance will match high expectation. This observation has proven valid not only for the introductory IS class, but for all my classes. Typically, short projects will have one-page specifications, and longer projects two-page specifications. Clear specifications have the added virtue of making the grading process more clear cut. The amount of latitude students have in meeting the specifications depends on the project: if the project is geared to computer literacy, there is little latitude. For those projects focusing on higher order learning skills--

application, synthesis, evaluation--students have more of a free rein.

STUDENT REACTION TO TEAM WORK

One encouraging result from the questionnaire was the student support of the team approach. Students strongly agreed (average of 4.30) that teamwork was an important part of the college experience, and strongly agreed (4.4 average) that teamwork was an important skill for the business world. Students agreed (average 3.78)) that working in teams was useful in learning computer skills in this class. Reaction to the team concept on the open-ended questions was heavily supportive.

LEARNING

Research has shown that, in a number of areas, students learn better in teams than as individuals. Questionnaire results lend some support to the contention. Students support the contention that working in teams was valuable in learning more quickly (average equals 3.78) and that working in teams was an aid in better remembering the concepts (average equals 3.56).

Other results include:

Working in teams promoted higher order learning . 3.65
Working in teams promoted spreadsheet learning . 4.02

Working in teams promoted understanding of
How computers work in the business worl 3.80

Less encouraging were these results:

Working in teams promoted writing skills 3.05
Working in teams promoted speaking skills 3.02

According to Dutt (1994), one of the advantages of teamwork is an increased self-esteem, an increased bonding with students and with the university. Such results make for laudable objectives, particularly with freshmen at universities where student retention is an issue. However, students did not support the contention that the teamwork made them feel more a part of the university (2.60). A few of the open-ended responses indicated that the use of ice-breaking exercises early on would alleviate the shortcoming.

PROJECTED CHANGES

Because of the formalized feedback provided by students, I anticipate an unparalleled magnitude of changes for the upcoming academic year. The literature and student feedback both support the expansion of teamwork to the classroom. Although the questionnaire was limited to questions concerning lab work, several students indicated in the open-ended questions that whereas the labs were satisfactory, the classroom could benefit from more teamwork. Student attendance in the lab sessions tended to be 20 percent higher than in the classroom, testimony to the potential of expanding teamwork to the classroom.

In a similar vein, students supported (open-ended question) the idea of expanding the number of team projects at the expense of individual projects. I believe such an expansion is tenable, particularly for those projects calling for higher order learning.

The literature suggests increased student involvement with teams if initial ice-breaking exercises are used. Student feedback was not so strong here, with an average of 3.07 agreement with the idea of ice-breaking activities. Nevertheless, intuition tells me that this is an instance where I should risk the attempt. Potential benefits far outweigh the cost of what students may perceive as trivial and unimportant activities.

I have been slow to move toward the fourth generation of introductory computer skills (Michelini, 1995) in the area of word processing. Fourth generation includes a move into desktop publishing and away from word processing. Although most of the emphasis on the three explicit word processing projects was on intelligent formatting, I would characterize this year's work as third-and-a-half generation. Student feedback indicates that while students tend to agree (average equals 3.95) that they learned a great deal about word processing, there is perhaps room to move into even more desktop-oriented exercises.

One of the student projects culminated in a formal oral and written presentation of team research into social, legal, and cultural ramifications of information systems. Of course, formal oral presentations are an important part of our class in order to satisfy general education requirements, as well as being an academically sound practice. However, I have been very dissatisfied with the quality of the oral presentations. Some teams have done the necessary preparation and rehearsing to pull it off. The majority of presentations, while of generally sound content, were very lacking in polished delivery. In spite of repeated admonitions on my part, many students chose to read virtually their entire report.

Students tend to agree with my assessment. The question "Student presentations of such issues as ergonomics,

computer crime, disaster planning, etc., are more effective than learning from a teacher" received a neutral 3.07 average response. I have reluctantly concluded that if improved delivery is desired, then changes will have to be made. Perhaps more direction from me about what is acceptable and what is not acceptable is part of the solution. Perhaps raising the point value of the oral presentation (currently four percent) is necessary. Perhaps videotaping multiple student presentations is the answer.

SUMMARY

Teaching introductory information systems is an ongoing challenge. Self directed teams have been shown again and again to produce positive results in learning computer skills, in learning communication skills, and in learning interaction skills. This study has generally supported those findings.

However, defining the role of the instructor is also an evolutionary process. Trial and error approaches, over time, tend to produce more satisfactory results. A more systematic approach, including reliance on student feedback and analysis of student performance, yields promise of more rapid evolutionary advances.

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APPENDIX A
STUDENT QUESTIONNAIRE

LAB QUESTIONNAIRE Name:
MIS 276
10 points

[For the first 24 questions, students responded on a scale of one (strongly disagree) to five (strongly agree).]

1. Learning to work together in teams is an important part of the college experience.
2. Working in teams is an important part of the business world.
3. Working in teams helped me learn to use the computer more quickly than working alone.
4. Working in teams has helped me to remember better how to use the computer.
5. In order to successfully work on teams in this class, I had to do more thinking than just learning facts.
6. I gained experience with writing skills in this lab.
7. I gained experience with speaking skills in this lab.
8. I learned a lot about spreadsheets in this lab.
9. I learned a lot about word processing in this lab
10. I learned a lot about using the Internet as a research tool.
11. I learned a lot about how computers are used in the business world in this lab.
12. Working on teams made me feel closer to the University.
13. I feel I have learned a great deal about computers with my lab work.
14. We should spend less time on word processing and more time on desktop publishing (publishing newsletters, flyers, etc.).
15. Student presentations of such issues as ergonomics, computer crime, disaster planning, etc., are more effective than learning from a teacher.
16. The course should have group exams as well as individual exams.
17. Students should receive individual grades rather than one team grade for the Scavenger Hunt and for the written team report.
18. I spent a lot of time working with others on the lab assignments.
19. I learned more from my teammates than they learned from me.
20. Each of the members of my team contributed about equally to the team projects.
21. I contributed my fair share to the team project.

22. Students should have more control in forming teams.

23. Students should be allowed to grade other team members' efforts.

24. We should have more team-based projects; for example, deriving a name for the team, establishing rules for members' behaviors, publishing a team newsletter, researching information systems in a real company, etc.

25. Where did not of your computer learning come from? Circle the appropriate response.
A. team B. yourself C. instructor D. none of the above

26. If you could make one change to the way teams operate for the next semester, what would it be?

27. If there was one thing you believe should remain the same next semester, what would it be?